

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	: Zhigang Qi et al.	Art Unit	: 1745
Serial No.	: 10/736,480	Examiner	: Tony Sheng Hsiang Chuo
Filed	: December 15, 2003	Conf. No.	: 3469
Title	: FUEL CELL DIFFUSION LAYER		

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

REPLY TO ACTION OF SEPTEMBER 5, 2006

In reply to the Office Action of September 5, 2006, Applicant submits the following remarks.

The Examiner rejected claims 1-2, 18, and 33 under 35 U.S.C. § 112, ¶ 2 as being indefinite because, in the Examiner's view, the meaning of the symbol “/” is unclear. However, the specification distinctly recites that “[a]s used herein, the symbol “/” refers to a direct bond between the sulfur atom in the sulfonic acid moiety and the fuel cell diffusion layer.” (See, e.g., page 4, lines 19-20.) Thus, Applicants request reconsideration and withdrawal of this rejection.

The Examiner rejected claims 1-3, 5, 6, 11, 12, 18-23, and 33-39 under 35 U.S.C. § 102(e) as being anticipated by Barton et al., U.S. 2003/0157397 (“Barton”) as evidenced by Kiefer et al., U.S. 2005/0084727 (“Kiefer”). Claims 1-3, 5, 6, 11, 12, 18-23, and 33-39 require a diffusion layer (e.g., a fuel cell diffusion layer) and an acid moiety (e.g., a sulfonic acid moiety) covalently bonded to the diffusion layer. Barton discloses that a sulfonic acid moiety can be bonded to a carbon atom within a polymer. (See, e.g., Barton par. 0064.) Barton also discloses immersing a carbon paper or fabric in a solution or dispersion of a this polymer for a period of time sufficient for the carbon paper or fabric to absorb the desired amount of the polymer. (Id, par. 0075.) It appears that the Examiner's view is that this would result in cleavage of the bond between the sulfonic acid group in the polymer and the carbon atom in the polymer, followed by formation of a bond between the sulfonic acid group and the carbon paper or fabric, thereby yielding a sulfonic acid group covalently bonded to a carbon atom in the carbon paper or fabric.

But, this would result in the composition of the polymer changing during this treatment.

Certainly, Barton does not explicitly disclose that such a process takes place. For example, Barton discloses:

In the process of the invention, the carbon paper or fabric may be immersed in a solution or dispersion of *the first fluorinated polymer* for a period of time sufficient for the carbon paper or fabric to absorb the desired amount of *the first fluorinated polymer*. The immersion time may be as little as about 30 seconds or as long as several minutes. The concentration of the first fluorinated polymer in the solution or dispersion will also determine the concentration in the paper or fabric. Typical concentrations of the first fluorinated polymer, in solution or dispersion, are in the range of about 0.1% by weight to about 10% by weight. (*Id.*, emphasis provided.)

Barton also discloses:

In a second aspect, the invention provides a process for forming a gas diffusion backing comprising:

(W) contacting a porous carbonaceous paper or fabric comprising carbon fibers with a *first fluorinated polymer to impregnate said first fluorinated polymer into the paper or fabric* and at least partially coat said fibers, thereby forming a porous first layer containing at least 50% by volume of carbon fibers (*Id.* at pars. [0023] and [0024], emphasis provided.)

Thus, it is apparent that the polymer contained in the solution in which the carbon paper or fabric is immersed (the “first fluorinated polymer”) remains unchanged after it is absorbed/impregnated in the carbon paper or fabric (i.e., is still referred to as the “first fluorinated polymer”), and that Barton therefore does not explicitly disclose a diffusion layer (e.g., a fuel cell diffusion layer) and an acid moiety (e.g., a sulfonic acid moiety) covalently bonded to the diffusion layer, as required by claims 1-3, 5, 6, 11, 12, 18-23, and 33-39. Nor does Barton inherently disclose the subject matter covered by these claims. To establish inherent disclosure, one must show that the subject matter is “necessarily present [in the prior art reference] and that it would be so recognized by persons of ordinary skill.” (*Electro Sys. S.A. v. Cooper Life Sciences*, 34 F.3d 1048, 1052 (Fed. Cir. 1994), emphasis provided). Here, the examiner has not satisfied this burden. For example, as would be recognized by a person of

ordinary skill in the art, Barton's use of the same terminology ("first fluorinated polymer") to describe the polymer before it is absorbed/impregnated into the carbon paper or fabric and after it is absorbed/impregnated into the carbon paper or fabric demonstrates that the process of absorbing/impregnating the polymer into the carbon paper or fabric does not necessarily change the polymer. Further, as would also be recognized by a person of ordinary skill in the art, the conditions to which the polymer is exposed during the absorption/impregnation process (e.g., 300 °F for two hours) would not necessarily cause cleavage of the covalent bonds between sulfonic acid moieties and carbon atoms in the polymer. In view of the foregoing, Applicants believe that the Examiner's reliance on Kiefer is rendered moot, and request reconsideration and withdrawal of this rejection.

The Examiner rejected claims 4, 7-10, 13-23 and 33-39 under 35 U.S.C. § 103(a) as being unpatentable over Barton as evidenced by Kiefer alone or in view of US 2003/0198860 ("Yasumoto") or US 2001/0031387 ("Takeda"). Claims 4, 7-10, 13-23 and 33-39 require a diffusion layer (e.g., a fuel cell diffusion layer) and an acid moiety (e.g., a sulfonic acid moiety) covalently bonded to the diffusion layer. As explained above, Barton as evidenced by Kiefer does not disclose this subject matter. Nor does Barton as evidenced by Kiefer suggest this subject matter. Neither Yasumoto nor Takeda cure the infirmities of Barton as evidenced by Kiefer, at least because, like Barton as evidenced by Kiefer, neither Yasumoto nor Takeda disclose or suggest a diffusion layer (e.g., a fuel cell diffusion layer) and an acid moiety (e.g., a sulfonic acid moiety) covalently bonded to the diffusion layer. None of Barton as evidenced by Kiefer, Yasumoto or Takeda, alone or in combination, discloses or suggests the subject matter covered by claims 4, 7-10, 13-23 and 33-39. There is no suggestion to combine these references to provide such subject matter, and, even if the references were combined, the result would not be the subject matter covered by these claims. Accordingly, Applicants request reconsideration and withdrawal of these rejections.

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Applicants believe that the application is currently in condition for allowance, which action is requested. Please apply any charges or credits to deposit account 06-1050.

Respectfully submitted,

Date: December 4, 2006

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